

NON-PUBLIC?: N
ACCESSION #: 9202100084
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Clinton Power Station PAGE: 1 OF 07

DOCKET NUMBER: 05000

TITLE: Internal Fault In The "B" Phase Main Power Transformer Resulted
In A Turbine Generator Trip And An Automatic Reactor SCRAM
EVENT DATE: 01/04/92 LER #: 92-001-00 REPORT DATE: 01/31/92

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 099

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: S. E. Rasor, Director - Plant TELEPHONE: (217) 935-8881
Maintenance, Extension 3204

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: EL COMPONENT: XFMR MANUFACTURER: G080
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On January 4, 1992, with the plant in POWER OPERATION at 99 percent reactor power, the "B" phase main power transformer (MPT 1B) failed due to an internal fault. The transformer failure resulted in a turbine generator trip and an automatic reactor SCRAM. The automatic reactor scram occurred due to the turbine control valve fast closure. Within seconds of the SCRAM, the turbine driven reactor feed pump (TDRFP) 1B tripped. Additionally, after the reactor SCRAM was reset, a SCRAM discharge volume (SDV) drain valve failed to reopen and a SDV vent valve only opened to an intermediate position. The cause of the SCRAM was an internal fault in MPT 1B. The cause of the TDRFP 1B trip was attributed to a worn thrust bearing, and the cause of the SDV vent and drain valves failing to reopen was attributed to air leakage past the seat of a three-way solenoid valve. Corrective actions for this event include replacing the failed MPT with a spare MPT, restoring the TDRFP 1B thrust bearing

clearance to original manufacturer specifications, and rebuilding the three-way solenoid valve.

END OF ABSTRACT

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DESCRIPTION OF EVENT

On January 4, 1992, at 0217 hours, with the plant at 99 percent reactor power in Mode 1 (POWER OPERATION), an internal fault in the "B" phase

main power transformer (MPT 1B) XFMR! occurred resulting in a turbine generator TG! trip and a fast closure of the turbine control valves which caused an automatic reactor RCT! SCRAM. Within seconds of the reactor SCRAM, turbine driven reactor feed pump (TDRFP) P! 1B tripped.

At 0218 hours, control room operators reset the SCRAM logic.

By 0220 hours, main control room personnel noted on the sequence of events IQ! printout that the MPT 1B sudden pressure trip relay had actuated. Control room operators also verified that the SUDDEN PRESSURE MPT 1B annunciator was alarming.

By 0225 hours, the operators had determined that the automatic deluge system for MPT 1B and MPT 1C had initiated. Operators were dispatched and did not observe any fire on MPT 1B or on MPT 1C.

At 0310 hours, non-licensed operators isolated the deluge system for MPT 1B and MPT 1C to facilitate access to the lockout relays 86! and to allow the fire pumps to be restored to standby.

By 0323 hours, control room operators noted that SCRAM Discharge Volume (SDV) drain valve V! 1C11-F011 had not reopened and that SDV vent valve 1C11-F010 indicated an intermediate position.

By 0325 hours, a non-licensed operator had restored the horizontal fire pump (0FP03P) to standby status.

By 0335 hours, a non-licensed operator had restored the "B" fire pump (0FP01PB) to standby status.

At 0436 hours, a non-licensed operator manually opened valve 1C11-F001 to drain the SDV.

At 0441 hours, a non-licensed operator returned the handwheel for valve

1C11-F011 to the neutral position, and valve 1C11-F011 immediately returned to the closed position. Since the SCRAM logic had been reset, valve 1C11-F011 should have remained open.

By 0535 hours, the fire protection deluge system for MPT 1B and MPT 1C had been restored to standby condition.

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No other automatic or manually initiated safety system responses were necessary to place the plant in a safe, stable condition. No other equipment or components were inoperable at the start of this event such that their inoperable condition contributed to this event.

CAUSE OF THE EVENT

The cause of the event is due to an internal fault in MPT 1B. Illinois Power (IP) is evaluating if the failed transformer should be shipped to a repair shop to have a failure analysis performed to determine, if possible, the cause of the internal fault. IP will submit a supplemental report if the cause of the failure is identified and if the cause of the failure significantly changes the information provided in this report.

The following paragraphs discuss the equipment problems that occurred subsequent to the reactor SCRAM:

TDRFP 1B Trip

Troubleshooting conducted on the TDRFP 1B indicated that the most probable cause of the TDRFP trip was due to a worn thrust bearing on the feed pump. A check of the feed pump thrust bearing clearance indicated that the clearance was larger than the clearance specified by the manufacturer. In addition, the increased feedwater demand resulted in an increased thrust on the TDRFP thrust bearing. This increased thrust, coupled with a larger than specified thrust bearing clearance, is suspected to have caused the thrust bearing wear trip to actuate.

The increased feedwater demand resulted from the set-point set-down logic initiating. The set-point set-down logic initiated due to the reactor water low level 3 condition, which normally occurs after a reactor SCRAM. The set-point set-down logic causes a larger demand for feedwater for about ten seconds, followed by a demand decrease. This logic is designed to minimize the reactor level decrease that occurs after a reactor SCRAM due to the collapse of voids.

Failure of the SDV Vent Valve and Drain Valve To Open

Subsequent to the event, troubleshooting of the SDV drain and vent valves identified the following deficiencies (refer to Figure 1):

- o Air leaked out of the vent ports of the three-way solenoid valves 1C11-F009 and 1C11-F182 when they were energized.

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- o Valve 1C11-F011 immediately opened and remained open when the instrument air time delay valve (1C11-F159A) was manually opened about one-eighth of a turn.

- o A small piece (less than 1/16 inch) of foreign material (believed to be solder) was found between the backseat and disc of valve 1C11-F009.

- o The bench settings for valve 1C11-F010 were found to be 6 and 30 pounds per square inch gauge (psig). Bench settings of 6 and 30 psig means that the valve starts to open at 6 psig and is fully open or backseated at 30 psig. The correct opening bench settings for 1C11-F010 are 18.5 and 60 psig.

- o The bench settings for valve 1C11-F011 were found to be 20 and 62 psig. The correct bench settings for 1C11-F011 are 18.5 and 60 psig.

- o Maintenance noted that the SDV vent valve (1C11-F180) operated erratically when stroked repeatedly. The valve stem was found to be bent and galling was noted on the disc and stem. Additionally, the bench settings for 1C11-F180 were found to be 8 and 25 psig whereas the correct bench settings are 3 and 15 psig.

Based on the deficiencies identified above, the cause of valve 1C11-F011 failing to open and valve 1C11-F010 only opening to an intermediate position is attributed to the air leakage past the seat of valve 1C11-F009. In May of 1991, personnel discovered that valve 1C11-F011 took approximately 17 minutes to reopen, and Maintenance Work Request MWR D17319 was written to address the slow reopening time. However, MWR D17319 was not scheduled to be worked until the next refueling outage, currently scheduled to begin March 1992. Based on the findings noted above, the slow opening time of valve 1C11-F011 noted in May 1991 is attributed to the small amount of air leaking past the seat of valve 1C11-F009 and out the vent port. In

May of 1991, valve 1C11-F159A provided sufficient air volume to eventually pressurize the air header enough to open valve 1C11-F011, but the leakage past valve 1C11-F009 continued to increase. Valve 1C11-F159A is a throttle valve which creates a time delay for the closing of valves 1C11-F011 and 1C11-F010. In January, due to the increased leakage past the seat of valve 1C11-F009, valve 1C11-F159A at the throttled position was not capable of supplying enough air volume to pressurize the air header completely. Therefore, due to the variance between the bench settings of valves 1C11-F010 and 1C11-F011 and the reduced pressure in the air header, valve 1C11-F010 opened to an intermediate

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position and valve 1C11-F011 failed to move from the closed position.

CORRECTIVE ACTION

MPT 1B was replaced with a spare MPT under MWR D10238.

The following corrective actions address the equipment problems which occurred subsequent to the reactor SCRAM:

TDRFP1B

The TDRFP 1B thrust bearing was machined and shims were added to restore the thrust clearance to be within original manufacturer specifications per MWR D28271.

SDV Vent and Drain Valves

Valves 1C11-F009 and 1C11-F182 have been rebuilt per preventive maintenance tasks (PM) PMMRDM003 and PMMRDM004. In addition, the bench settings for valves 1C11-F010, 1C11-F180, and 1C11-F011 were reset to their correct values, and valve 1C11-F180 was rebuilt per MWR D17319.

The Nuclear Station Engineering Department (NSED) has performed a review to determine if similar applications exist where an instrument air throttle valve is used to perform a time delay for the opening or closing of air operated valves. There were no other applications found. Additionally, the five-year PMs to rebuild valves 1C11-F009 and 1C11-F182 are being evaluated to determine if they are adequate and if an increased frequency is needed. NSED will also evaluate the need for a routine PM to check the bench

settings on valves 1C11-F010, 1C11-F011, 1C11-F180, and 1C11-F181. Maintenance will blow down the air lines which supply air to the SDV vent and drain valves. These actions are scheduled to be completed by May 30, 1992. Finally, to determine if system enhancements are needed, NSED will evaluate alternative means of providing the opening and closure delay for the SDV vent and drain valves. This action is expected to be completed by July 30, 1992.

Station procedure 9012.01, "SCRAM Discharge Volume Vent and Drain Valve Operability Test" will be revised to ensure that the opening and closure times for valves 1C11-F011, 1C11-F010, 1C11-F180 and 1C11-F181 are recorded and verified against the design criteria. This action is scheduled to be completed by May 30, 1992.

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ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(iv) due to the automatic initiation of the Reactor Protection System JC!.

Assessment of the safety consequences and implications of this event indicates that this event was not nuclear safety significant. This transient was compared to a similar transient, "Generator Load Rejection with Bypass", described in Chapter 15 of the Updated Safety Analysis Report and the Transient Safety Analysis Design Report (GEZ-7355). The event was found to be within the design basis of the plant.

ADDITIONAL INFORMATION

The failed MPT is a General Electric model 390E648, single phase, 310/347 MVA, forced oil and air, 60 Hertz, with a low voltage side of 22,000 V and a high voltage side of 345,000 V.

LER 88-028-00 discussed a main transformer fault which resulted in a turbine generator trip and a reactor scram.

LER 89-028-00 discussed the failure of a sudden pressure relay on MPT which resulted in a turbine generator trip and a reactor SCRAM.

For further information regarding this event, contact S. E. Rasor, Director-Plant Maintenance, extension 3204.

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Figure 1 omitted. (no title available)

ATTACHMENT 1 TO 9202100084 PAGE 1 OF 1

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Clinton Power Station
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POWER
U-601929
L45-92(01-31)-LP
2C.220

January 31, 1992

10CFR50.73

Docket No. 50-461

Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1
Licensee Event Report No. 92-001-00

Dear Sir:

Please find enclosed Licensee Event Report No. 92-001-00: Internal Fault In The "B" Phase Main Power Transformer Resulted In A Turbine Generator Trip And An Automatic Reactor SCRAM. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,

F. A. Spangenberg, III
Manager, Licensing and Safety

KWD/alh

Enclosure

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690

NRC Region III, Regional Administrator
Illinois Department of Nuclear Safety
INPO Records Center

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